

CHAPTER 8 - ELLIOTT BAY SUBBASIN OPERATION IMPACTS

Impacts associated with any of the project alternatives are generally divided into two categories: impacts related to short-term construction activities and impacts associated with the long-term operation of the proposed CSO control facilities. The impacts associated with operation of the Denny/Lake Union Project are primarily the benefit to water quality, which in turn affects biological resources, recreation, environmental health, and aesthetics. Reduction of CSO flow volumes to one untreated discharge per outfall per year would greatly reduce CSO-related pollutant discharges to Elliott Bay compared to the baseline overflow of over 405 MG of untreated sewage for the Denny Way CSO.

This chapter describes the impacts in the Elliott Bay Subbasin from operation of Phases 2 and 3/4 for both the Preferred Alternative and Alternative 2. Cumulative impacts are discussed in Chapter 9. Mitigation measures to mitigate adverse impacts are provided in Chapter 10.

For some elements of the environment, the Alternative 3 - No Action Alternative would produce no operation impacts. Under the No Action Alternative, King County and Seattle would continue to discharge untreated combined sewage out the existing outfalls and a decrease in water quality would continue. The elements affected by the No Action Alternative are water, biological and environmental health.

8.1 EARTH RESOURCES

No impacts to onshore earth resources in the Elliott Bay subbasin would occur from operation of the facilities under Alternative 1. Off shore the discharge of CSOs with contaminated sediments would be significantly reduced during operation of the facilities. Some contaminated sediments may be discharged from the stormwater outfalls into Elliott Bay under Alternative 2. Under Alternative 3, sediments off shore of the Denny Way CSO would continue to be contaminated from the overflows.

8.2 AIR RESOURCES

8.2.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Operation of a new outfall and extension of the existing outfall in Myrtle Edwards Park would result in no significant adverse odor-related impacts. Extending and submerging the outfall would likely improve existing odor conditions associated with the present shoreline discharge. The present outfall generates odors because it is close to shore; the new outfalls would be placed well offshore and underwater, far out of range of onshore receptors in Myrtle Edwards Park and surrounding businesses.

Conveyance

No significant odor-related impacts would be associated with operation of conveyance facilities. Impacts would be similar to those discussed for South Lake Union Subbasin operation impacts.

Regulating Structures

Odors generated at the wetwell associated with the Denny Way Diversion Structure would be unlikely. Due to the presence of anaerobic conditions and turbulence, odors could be generated and have the potential to be noticed by many individuals due to the facility's location near Myrtle Edwards Park and adjacent businesses. However, because of the relatively dilute nature of CSO flows, velocity of flows during CSO events, and the fact that most CSO events occur during rainstorms when park use is low, impacts are not expected to be significant. In addition, the facility would be an airtight, sealed structure, minimizing odor potential.

CSO Control

Operation of the Elliott West CSO Control Facility and the Mercer Street Tunnel could generate odors objectionable to residents and commercial businesses located in the vicinity. Gases would be vented from the storage facility and the tunnel at times; however, properly operated and maintained CSO facilities generally have a lower level of odor production than combined sewage facilities. The site would operate only during the wettest days of the year when the potential for odors to form is low, because cool, dilute sewage is less likely to produce odors. The greatest potential for odor generation generally occurs during the summer months when higher temperatures and concentrated sewage can enhance odor generation. Specific components of this facility with the potential to generate odors include the Influent Pump Station, Elliott Bay Interceptor Control Structure, and Tunnel Effluent Channel. Medium- to high-strength odors would be possible at the pump station and control structure, while odors at the tunnel effluent channel would likely be of low strength. All odors would only be expected to occur during CSO events. Activated carbon scrubbers would be provided at the proposed wetwell and outfall control structure. With treatment by carbon absorbers, it is anticipated that any odor problems would be minimized.

8.2.2 Alternative 2 - Partial Separation and Storage

Outfalls

Construction of the proposed four outfalls would not result in any significant increase in odors. These outfalls would convey stormwater only, which is not a significant source of odors.

Conveyance

Impacts from conveyance facilities would be similar to those under Alternative 1. No odor-related impacts are anticipated from the 14 miles of Elliott Bay Stormwater Pipelines that would be constructed under Alternative 2. This collection system would only transport stormwater. Odor generation would be greatest in the separated sanitary lines, because flows would be relatively more concentrated and of higher temperature compared to CSO flows. Odor generation potential in sanitary sewer conveyance facilities would generally be greater under this alternative than Alternative 1.

Regulating Structures

Impacts from operation of the Denny Diversion Structure would be the same as under Alternative 1.

CSO Control

Operational impacts would be similar to the Elliott West CSO Control Facility impacts under Alternative 1, but could be slightly greater as storage tank capacity would be larger.

8.2.3 Alternative - No Action

The potential for odor generation would be approximately the same or slightly greater than under current conditions. If future CSO frequencies/volumes increase, the potential for odor generation during CSO events would increase accordingly, however, CSO events are not highly odorous because of the dilute nature of the flows and the cold weather conditions which typically prevail during CSOs.

8.3 WATER RESOURCES

Because the area is almost entirely developed, future wastewater flows and stormwater generated by impervious surfaces are not expected to increase noticeably from current levels. Therefore, no impacts from increased future flows are expected to occur.

8.3.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Surface Water. Operation of the proposed Elliott West Outfall and the Denny Way CSO Outfall Extension would result in long-term water quality benefits to Elliott Bay. CSO discharges in the nearshore environment would be eliminated and relocated to an area where preliminary oceanographic investigations indicate effluent transport would be improved over existing conditions. These impacts would result from the operation of the CSO control facility and are described below under CSO control.

Groundwater. No operational impacts to groundwater are associated with operation of the Elliott West Outfall or Denny Way CSO Outfall Extension.

Conveyance

Surface Water. Operation of conveyance structures, in that they contribute to reduction of CSO discharges to the Elliott Bay Subbasin, result in positive water quality impacts as described above for Outfalls.

Groundwater. There is a minor risk that pipelines could break, exposing adjacent groundwater to a dilute concentration of untreated wastewater and stormwater. However, such potential breaks

would be considered rare, as pipelines are designed to withstand stresses, corrosion, and potential rupture from earthquakes, surface loads, and soil instability.

Regulating Structures

Surface Water. As described for conveyance facilities, the Denny Way Diversion Structure is necessary to provide CSO storage at the Elliott West site, and as such, contributes to net water quality benefits in Elliott Bay.

Groundwater. Operational impacts would be similar to those described for conveyances.

CSO Control

Surface Water. CSO discharges at the existing Denny Way CSO would be reduced from the 1981-83 baseline of approximately 405 MG annually to an average of approximately 8 MG by project completion. An average of 80 MG per year would be treated at the Elliott West CSO Control Facility and 443 MG per year treated at West Point. Untreated CSO events at the existing Denny Way CSO, along the shoreline of the heavily used Myrtle Edwards Park, would be reduced from the current level of approximately 50 events annually to approximately one event. Depending on rainfall, treated discharges would occur approximately 11 to 14 times per year. In addition to reducing the number of CSO events, the quality of discharged flows would be improved, as described below.

Extending the Elliott West Outfall a distance of approximately 500 feet to discharge at a depth of approximately 60 feet below MLLW would result in improved chronic dilution (near 0 dilution currently to an estimated 10 to 1 ratio for the once per year frequency design storm) and dispersion of treated CSO flows. Most discharges would receive significantly higher dilution. The existing Denny Way CSO discharging untreated flows approximately once per year would be extended to MLLW up to 100 feet offshore and a water depth of 20 feet. This would discharge effluent further offshore from beaches and the shoreline. The new outfall would terminate shoreward of the existing sediment cap to avoid scouring and deposition during overflow events. While water quality within the outfall discharge zones would be temporarily degraded during CSO events, the impact would be localized and short term. Overall, impacts to water quality and habitat in Elliott Bay would be positive.

Discharge from the Elliott West Outfall would result in significantly reduced loading to the nearshore area, however, it would increase potential contaminants of concern in the offshore areas near the new outfall location. Recent water quality modeling indicated that extending the CSO discharge offshore would increase levels of contaminants of concern in the vicinity of the new outfall, however, concentrations were not predicted at levels which would present a risk to aquatic species in the water column. Predicted concentrations of contaminants of concern to human health were projected to decrease, particularly in nearshore areas, but human health risks (as defined by bacterial contamination without disinfection) would not be eliminated. Disinfection of treated discharge would largely, but not completely, address this risk.

The reduction in discharge of Total Suspended Solids (TSS) at the Denny Way CSO depends on several factors including the reduction in annual volume of discharge, TSS concentrations in the

untreated flows, and physical characteristics of the suspended solids. Treatment at the Elliott West CSO Control Facility would reduce suspended solids in CSO discharges at this location. Preliminary estimates indicate that the TSS discharge at the Denny Way CSO would be reduced by 10 to 75 percent compared to the 1981-83 baseline. Accompanying reductions in contaminants associated with suspended solids would be achieved.

Reduced loading from the CSO discharges would lessen contaminant contributions to chronic sediment deposition in Elliott Bay, which would help to improve long-term water quality. Eliminating CSO discharges in the onshore area would contribute to the sediment remediation effort being undertaken with the Denny Way Sediment Capping Project. While CSO-related sediment deposition would decrease onshore, it may increase in the area of the new and extended outfalls.

Floatables and debris would be significantly reduced from the discharges, resulting in aesthetic improvements, as well as public health benefits. Bacterial levels would decline associated with disinfection. Recent evaluations have indicated that bacterial levels would rarely, if ever, exceed the upper limit of 43 organisms/100 mL outside the chronic mixing zone at the peak day flow (Brown and Caldwell 1996). The projected reduction in pollutant loading, accompanied by the reduced frequency of CSO events, would result in a net water quality benefit to Elliott Bay.

Operation of the Elliott West CSO Control Facility would provide for settling of heavier particles, floatable material control and disinfection of CSO flows prior to discharge to Elliott Bay. Combined with the diversion of stored flows to the West Point Treatment Plant, reduction in the discharge of suspended solids at the Denny Way CSO of approximately 70 to 75 percent would be achieved compared to the 1981-83 baseline. Because quiescent settling is provided within the Elliott West CSO Control Facility, only relatively heavier particulates would be removed. Finer particulates that require extensive detention times or additional treatment processes for removal would not be removed, nor would dissolved contaminants. Treated discharges would be chlorinated to reduce bacteria levels in the discharges. Preliminary evaluations indicate that water quality standards for fecal coliform bacteria would be met at the edge of the chronic dilution zone for treated discharges.

Because the Elliott Bay Subbasin is largely developed, noticeable increases in either wastewater flows or impervious surfaces that could generate stormwater runoff are not expected. Therefore, these flows are not expected to increase over existing conditions.

Groundwater. Operational impacts associated with the Elliott West CSO Control Facility would be similar to those discussed under conveyances.

8.3.2 Alternative 2 - Partial Separation and Storage

Operational impacts to groundwater are the same as described under Alternative 1.

Outfalls

Surface Water. Water quality improvements associated with reduction of untreated CSO flows would be similar to, but generally less than, those described for Alternative 1, because this alternative includes the construction of four new stormwater outfalls to convey separated stormwater to Elliott Bay. The outfalls would be constructed along the waterfront near Myrtle Edwards and Elliott Bay parks. While benefits would occur from reducing CSO discharges with accompanying bacterial and solids loading to a total of approximately once per year, pollutant loading of metals and petroleum hydrocarbons to Elliott Bay from separated stormwater could increase from untreated runoff. Based on analysis of proposed partial separation for the Michigan Regulator, total volume and metals mass discharge reductions of only 10 - 20% might be expected from existing levels.

Conveyance

Surface Water. Although the reduction of untreated CSO discharges would have significant public and aquatic health benefits, discharge of separated stormwater would result in continued though reduced inputs of metals, suspended solids, and to a lesser extent, bacteria. As discussed for the South Lake Union Subbasin, continued stormwater discharges would contribute to short-term, localized impacts in the vicinity of the stormwater outfalls following each storm event, as well as contribute to long-term sediment deposition of particulates associated with stormwater. Therefore, although this alternative would contribute to a long-term trend of reducing pollutant loadings to Elliott Bay and nearshore sediments, the water quality benefits would be of lesser magnitude than those associated with Alternative 1.

Regulating Structures

Surface Water. Impacts are the same as discussed for Alternative 1.

CSO Control

Surface Water. Water quality impacts are similar to those described for Alternative 1. Implementation of this alternative would ultimately reduce annual overflow frequencies at the Denny Way CSO to an average of one untreated event per year. Water quality benefits would result, as described for Alternative 1.

Implementation of Alternative 2 would result in discharges of up to 66 million gallons (MG) of stormwater with every major rainfall event. While discharge to Elliott Bay would be treated in compliance with the municipal Nationwide Pollutant Discharge Elimination System (NPDES) permit issued to the City and King County as co-permittee, there are likely to be constituents of concern to juvenile salmonids in discharges. A constituent of particular concern to juvenile salmonids, and one which is commonly found in stormwater, is copper. Because dissolved copper can represent as much as 40 to 50 percent of total copper concentrations, it is difficult to remove

from stormwater by currently available stormwater control technologies. Copper is toxic to juvenile salmonids at very low concentrations, and levels of copper in treated stormwater may be high enough to cause concern. The mean concentration of copper measured during four events from December 1996 through March 1997 (Herrera 1997) was approximately 52 µg/L; the dissolved copper concentration was 18 µg/L. These concentrations exceed the EPA's water quality criteria to protect saltwater aquatic organisms which is not to exceed a 1-hour average of 2.9 µg/L more than once every three years. Some additional dilution would occur to CSO flows depending on outfall placement, but short-term copper levels would be of concern during net pen operations.

8.3.3 Alternative 3 - No Action

Surface Water. Under the No Action Alternative, CSO events would continue at current volumes and frequencies. Currently, approximately 50 events discharge into Elliott Bay an average of approximately 405 MG of CSOs at the Denny Way CSO annually. These discharges would continue to impact the nearshore environment through loading of bacteria, metals, organics, and other material to sediments. Some contaminants would also remain suspended in the water column. As developmental intensity increases (e.g., traffic volumes increase, vacant lots are developed, etc.), contaminant loading in runoff would increase and water quality in Elliott Bay would be expected to decline as overall pollutant loading increases.

Groundwater. Impacts to groundwater would remain unchanged from existing conditions.

8.4 BIOLOGICAL RESOURCES

8.4.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Biological Resources impacts from Alternative 1 outfalls, conveyance and regulating structures are related to the operation of CSO control facilities and wastewater system. Beneficial impacts from reduction in overflows to Elliott Bay resulting from operation of the CSO control portion of this project are extensive.

Plants, Wildlife and Habitat. Once construction is complete, operation of the Elliott West Outfall and the Denny Way CSO Outfall Extension would beneficially affect plants and animals in the marine environment. Discharges would contribute approximately 70 to 75 percent less solids to the water column and surrounding sediments than under the 1981-83 baseline condition. At present, untreated discharges from the Denny Way CSO occur approximately 50 times per year adding approximately 405 MG of combined sewage to Elliott Bay per year. Under Alternative 1, annual discharges would be reduced to approximately 88 MG per year (including 80 MG per year treated and 8 MG per year untreated). Discharges would occur 11 to 14 times per year depending on annual rainfall. An untreated discharge would occur on average once per year. These overflow reductions would reduce pollutant contributions to the marine environment in Elliott Bay. Elimination of most overflows from the Denny Way CSO would improve water

quality conditions and, consequently, foraging habitat for wildlife and waterfowl dependent upon Elliott Bay. Cleaner bay water would likely contribute to increases in productivity of food sources (e.g., crustaceans, invertebrates, aquatic plants) for water-dependent animals in the intertidal area. Use of the shoreline by waterfowl, raptors, shorebirds, and other water-dependent birds and marine mammals would be encouraged as water quality improves. Although localized impacts may occur at the new outfall from new discharges to the bay, these impacts are anticipated to cause minor disturbance to marine macro-algae (e.g., kelp), waterfowl and marine animals since the new outfall is located at depths in excess of approximately 60 feet below MLLW within Elliott Bay. The extension of the existing CSO outfall would likely result in greater mixing and dilution of CSOs occurring at the Denny Way CSO. This would be beneficial to marine mammals and aquatic plants in the vicinity of the outfall.

Fisheries. Long-term operation of the outfalls would reduce chronic pollutant loadings to fish habitat in inner Elliott Bay. Under Alternative 1, discharge frequencies would be reduced by almost 80 percent from approximately 50 per year to 11 per year on average. The proposed project would ultimately reduce the volume of discharge to approximately 88 MG per year, a 78 percent reduction compared to the 1981-83 baseline, reducing potential impacts to fisheries resources in Elliott Bay. The new outfall would discharge approximately 500 feet offshore and would be designed to readily disperse discharges in ambient currents. Reductions in frequency and volumes of CSOs and improvement in CSO water quality would reduce potential exposure of fish to pathogens and contaminants, reduce the potential for ingestion of or entanglement in floatable material, and reduce the potential for localized dissolved oxygen “sags” following CSO events.

King County Metro (1995b) performed modeling which predicted the fate and transport of a number of water quality contaminants of concern associated with CSOs under existing conditions and following implementation of various CSO strategies being considered as part of the Regional Wastewater Services Plan. For Elliott Bay CSO alternatives, they concluded that primary treatment of CSOs (assumed to be 50 percent removal of solids and a 50 percent reduction in annual discharge volume) with a new offshore outfall “is expected to be substantially more protective than existing conditions.” This modeling, however, was conducted for an outfall at a depth greater than 60 feet. Subsequent analyses have indicated that the proposed CSO control facilities would reduce the concentrations of almost all contaminants of concern (e.g., heavy metals and organic pollutants) in the water column to below the applicable water quality standards at the edge of the dilution zone, with the potential exception of copper. Additional sampling and analyses are needed to determine if copper concentrations in treated CSO discharges are of concern to marine biota. Improvements in environmental protection are expected to occur in the nearshore areas, particularly for small fish and their prey. King County Metro noted, however, that the quality of offshore sediments in the vicinity of a new outfall would be reduced, resulting in localized negative impacts to benthic and epibenthic species.

Although overall impacts to Elliott Bay’s fishery resources would be positive, minor localized impacts in the immediate vicinity of a new outfall could occur depending on final location and design. Only under emergency conditions would CSOs be discharged through the extension of the existing outfall; most CSOs would pass through the Elliott West CSO Control Facility and be

discharged through the new outfall. A variety of fish, including salmonid species, are known to inhabit Elliott Bay (see Appendix H, Table H-2). During overflow events, fish species traveling through the discharge plume would be exposed to increased turbidity, decreased oxygen levels, and potentially elevated concentrations of metals, organic compounds, and pathogens. Chlorine, which is toxic to fish at relatively low levels, is proposed for disinfection of treated CSOs, however, dechlorination would be done prior to marine discharge. The duration of overflow and the extent of diffusion of the effluent plume would allow most fish to avoid the area during the event.

No significant disruption of recreational or tribal fishing activities is expected to occur. Preliminary oceanographic investigations indicate that discharging treated effluent at a depth of approximately 60 feet would cause the CSO plume to surface immediately and be transported to the intertidal area. Based upon anticipated levels of constituents in untreated CSOs (determined by existing CSO monitoring data) and anticipated treatment levels, parameters contributed by CSOs would meet water quality standards at the edge of the dilution zone. Given varying tidal, wind, and water current conditions, it is difficult to specifically determine levels of contaminants contributed by CSOs in the net pen area, but levels are expected to be consistent with water quality standards.

Outfall dilution calculations in this instance are complicated by the intermittent nature of the discharge. Also, there are two zones of dilution: 1) zone of acute criteria exceedance (ZACE) and 2) the mixing zone, where chronic criteria apply, which is beyond the ZACE. As a first approximation, Ecology rules for continuous discharges have been used with interpretation of the flows for the intermittent discharge. Results from this approach are presented in Table 8-1, assuming a copper concentration of about 44 micrograms per liter ($\mu\text{g/L}$) (the 95 percentile value found in the King County *Draft Water Quality Assessment* (King County Metro 1995b)). The numbers shown compare anticipated copper concentrations with the acute water quality standards at the edge of the ZACE (ZACE is 10% of the chronic zone size). There are no chronic marine criteria for copper. The acute marine water quality criterion for copper is $2.5 \mu\text{g/L}$.

Table 8-1
Dilution Achieved and Corresponding Copper Concentration

Flow Measurements	Value Equaled or Exceeded Once Per Year (mgd)	Corresponding Dilution at Chronic Boundary	Corresponding Copper Concentration at Chronic Boundary ($\mu\text{g/L}$)
Average monthly flow (monthly discharge volume/number of events)	20	22:1	2.0
Daily discharge volume	30	17:1	2.6
Peak day (average of actual discharge in one year event)	80	10:1	4.4

Discharge events occur about 11 to 14 times per year with a range from zero to as many as three times per month; most of these events occur between October and March. The duration of discharges ranges from about half an hour to 3 days, with an average of 8 hours. Subsequent dilution studies (Brown and Caldwell 1996b) indicate that the plume will surface and travel back to the beach with little additional dilution in winter conditions (southerly winds). However, it is estimated that dilution in subsequent travel northward would be at least 2:1 by the time the plume reaches the net pens. With this additional dilution, the copper concentration would be below the water quality standard when it reaches the pens.

The estimated concentration of contaminants in the net pen area was calculated using the 95th percentile of total copper loading concentration for untreated CSOs, as identified in King County Metro (1995b). Representative values from untreated CSOs were used for this estimate to provide conservative results. These results were generally corroborated by concentrations obtained during four separate overflow events sampled by King County from December 1996 through March 1997 (Herrera 1997). Mean concentrations within the mixing zone were estimated using dilution factors obtained from dilution modeling. These estimates, although rough, were considered to be conservative because assumptions for minimum dilution were used consistently. Additional evaluations would be conducted as part of the outfall design process, and additional monitoring would be conducted to better characterize oceanographic conditions, as well as constituent concentrations in the net pen area. Additional modeling to further evaluate plume dispersal would be conducted during outfall design.

Overall, contaminants of concern are expected to be reduced in the net pen area compared to existing conditions, because of the reduced number and volume of CSO discharges, as well as lower solids concentrations in treated CSO flows. Net reduction in overflow events and accompanying pollutant loads are expected to benefit fisheries habitat in Elliott Bay. The outfall would be pile supported, covered with a concrete “mattress” which forms a folded concrete layer over the outfall, eliminating the potential for entanglement of fishing equipment or anchors.

Shellfish. Overall, long-term impacts to shellfish would be positive. The new outfall would discharge seaward of the existing sediment cap. The Denny Way CSO Outfall Extension would discharge shoreward of the cap but be designed to minimize possible scouring of cap sands. This would minimize the probability that benthic communities and shellfish would be exposed to contaminated sediments.

A study by Thom and Chew (1980) evaluating impacts of CSO discharges to subtidal communities in Puget Sound indicated that communities nearest the Denny Way CSO were characterized by opportunistic species (e.g., the polychaete *Capitella capitata*), a low number of taxa, and a low species diversity. Reduction of untreated CSO overflow events and relocation of the discharge offshore (sited to optimize dilution and dispersion of overflows) would improve conditions for macroinvertebrate species in the area of the existing outfall, and potentially result in a return to normal diversity, abundance, and community structure over a period of one to several years (Smith 1974). Sediments deposited in the vicinity of the proposed outfalls could present an increased environmental risk to organisms inhabiting the outfall area. However, the net impact resulting from relocating the outfall would be positive due to the significant reduction in number of overflow events and total annual loading to the water column and sediments.

According to the *1996 Geoduck Atlas* (WDFW 1996) the closest geoduck populations are located off of West Point and just south of Alki Point, five to six miles from the proposed outfalls. No operational impacts to these areas are anticipated to result from either of the proposed outfalls. It is possible that geoducks populations and distribution in Elliott Bay could be more extensive than identified. All survey work for the *Atlas* was conducted between -18 MLLW and -70 MLLW; geoducks have been found as deep as 360 feet in certain areas of Puget Sound (WDFW 1996).

8.4.2 Alternative 2 - Partial Separation and Storage

Biological Resources impacts from Alternative 2 outfalls, conveyance and regulating structures are related to the operation of CSO control facilities and the wastewater system. Beneficial impacts from reduction in overflows to South Lake Union resulting from operation of the CSO control portion of this project are extensive.

Plants, Wildlife and Habitat. Alternative 2 would discharge separated stormwater through four stormwater outfalls into Elliott Bay. Alternative 2 is not anticipated to adversely affect plants or animals within the marine environment with the exception of fish and shellfish in Elliott Bay. Impacts to fish and shellfish are addressed in detail below. Overall, Alternative 2 is anticipated to provide less of a potential benefit to plants and animals as would occur under Alternative 1. Currently, approximately 405 MG of combined stormwater and sanitary sewage is discharged during about 50 events per year. Under Alternative 2, an estimated 66 MG of separated stormwater would be conveyed directly to Elliott Bay each year. Stormwater discharged to Elliott Bay would meet or exceed State of Washington and Federal water quality and sediment management standards. Reductions of untreated CSO discharges to Elliott Bay would have an overall beneficial impact on plants and animals similar to that described under Alternative 1.

Fisheries. Implementation of Alternative 2 would benefit fish species and habitat by reducing CSO events to once per year at the Denny Way CSO. During stormwater discharge events, stormwater velocities exiting the stormwater outfalls could disturb nearshore habitat. Stormwater discharges would be more frequent than existing conditions as all stormwater would be discharged to Elliott Bay. Stormwater discharges would occur approximately every rainfall, totaling approximately 66 MG annually. An increase in turbidity and discharge of sediments, metals, and organic pollutants associated with stormwater could expose fish inhabiting the nearshore environment, including juvenile salmonids utilizing nearshore nursery areas, to stormwater contaminants, as well as reduced light availability. Increased turbidity could be a problem for juvenile salmonids because it reduces visibility and increases their risk of predation. However, nearshore fish habitat quality in the project area is currently poor, as the shoreline contains little natural habitat and consists mainly of riprap and bulkheads.

Shellfish. Operational impacts to shellfish and other benthic communities in the vicinity of the stormwater outfalls could include a shift to prevalence of species tolerant to higher levels of particulate-associated pollutants, including metals. Implementing a separated stormwater system would result in an inflow into the nearshore areas of the Myrtle Edwards and Elliott Bay parks of 66 MG of stormwater at a frequency of every rainfall. This could perpetuate contaminant loading in the sediment plume (e.g., metals, fecal coliform) surrounding the outfalls, although stormwater would be discharged in accordance with state and federal water quality and sediment management standards resulting in a reduction in the degree of impact. Overall, the net impact to shellfish

would be positive due to significant reductions in CSO flows and associated pollutants. Reduction of solids associated with reduced CSO loadings would not eliminate metals contributions to sediments, however, it would lessen them and their impacts on shellfish.

8.4.3 Alternative - No Action

Marine water quality and sediment conditions adjacent to the existing Denny Way CSO would remain the same as under current conditions, and could worsen relative to biological conditions accompanying future flows. Solids deposited in the vicinity of the existing Denny Way CSO would continue to accumulate; cumulative impacts from CSOs and other sources of pollutant loading to Elliott Bay could contribute to overall reduced biological diversity in the vicinity of the outfall. Oxygen-demanding constituents in CSOs would reduce oxygen levels in the CSO discharge plume, and could continue to exert a localized oxygen demand from the sediments, resulting in potential impacts to biota. Toxic constituents in CSOs, including metals and low levels of organics, could have detrimental effects upon biota, particularly during sensitive life stages.

8.5 ENERGY

Intermittent operation of the regulating and control structures under Alternatives 1 and 2 would involve long-term consumption of electrical energy and maintenance vehicles would use fossil fuels. Usage of electricity from the new facilities is expected to be greater for either Alternative 1 or 2 than the 2.5 to 3 megawatts per year consumed by the Carkeek Plant. Alternative 3 would not have any new facilities and would therefore not use any additional energy resources.

8.6 ENVIRONMENTAL HEALTH

8.6.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Upon completion, the project would reduce the frequency and volume of Denny Way CSOs into Elliott Bay from an average of 50 events totaling approximately 405 mg per year to one untreated event by project completion. This reduction in the frequency and volume of discharges would substantially reduce the potential for human exposure to harmful bacteria, viruses, metals, and petroleum products contained in CSOs. In addition, overflows would undergo treatment at the Elliott West CSO Control Facility, further reducing potential environmental health impacts by removing an average of 50 percent of sediments.

Outfalls

As described for Water Resources (Section 8.3.1), the impact from operation of the outfall is directly related to operation of the CSO Control facilities, as described below. There is a minor risk that outfall pipelines could break, exposing waters immediately adjacent to the break to overflows. However, such breaks would not be anticipated, as pipelines would be designed to withstand stresses, corrosion, and potential rupture from earthquakes, damage from anchors or fishing gear, or loading from bottom slopes. The outfalls would also be buried over much of their length, further reducing the potential for exposure.

Conveyance and Regulating Structures

Operation-related impacts associated with conveyance and regulating structures are similar to those described for the South Lake Union Subbasin (refer to Section 6.6.1).

CSO Control

Extension of the existing Denny Way CSO and construction of a new offshore outfall under Alternative 1 would provide a substantial reduction in environmental health risks compared to existing conditions at the present outfall. By significantly reducing the annual number of untreated discharges, total bacterial and viral loadings in Elliott Bay would be reduced. Disinfection would substantially reduce bacterial concentrations in CSO discharges. With the exception of organisms in the immediate vicinity of the new discharge location, risk to aquatic organisms would also be reduced.

Placement of the outfall extension and new outfall discharges at a distance of up to 500 feet offshore and at a 60-foot depth at MLLW, also would greatly reduce the likelihood of human contact with overflows compared to the existing outfall located on the Myrtle Edwards Park shoreline. Given the existing nearshore location of the Denny Way CSO, individuals swimming, wading, or climbing along the riprap in Myrtle Edwards Park adjacent to the outfall can be exposed to CSOs during overflow events. The new outfall locations would eliminate potential direct contact of CSOs with shoreline users. All overflows except for one event per year would be treated and discharged through the outfalls offshore, and the potential for any human contact at this location and depth is low. At this depth, overflows would most likely be readily dispersed and would not expose intertidal/beach areas to substantial amounts of fecal coliform, bacteria, viruses, metals, or other contaminants. Refer to Section 8.3.1 for a discussion of water quality conditions associated with CSO discharges.

There is a minor risk of overflow at the Elliott West CSO Control Facility and exposing adjacent areas to untreated or treated overflows. However, such failures are unlikely, as the facility would be designed to withstand stresses and potential rupture from earthquakes and other catastrophic events. At the end of a storm event, the contents of the control facility would drain into the Elliott Bay Interceptor. Generally, when the facility reaches capacity, water would be treated and flow to the new outfall for discharge. Under emergency conditions, influent to the control facility would be diverted to the Denny Way CSO Outfall Extension, where it would be discharged offshore.

8.6.2 Alternative 2 - Partial Separation and Storage

Outfalls

Under Alternative 2, four new stormwater outfalls would be constructed close to the shore of Elliott Bay, below MLLW. These outfalls would convey stormwater to the bay during storm events and would discharge every rainfall event for a combined average total of approximately 66 MG per year. However, overall impacts to inner Elliott Bay would be reduced, as flows would not contain sewage and CSO events at the existing outfall would be reduced to one event per year. Stormwater would be treated in compliance with state and federal water quality and sediment management standards before discharge to minimize the risk of public exposure to stormwater contaminants. Outfalls also would be located to minimize environmental health impacts to users of Myrtle Edwards and Elliott Bay parks, taking into consideration areas of concentrated human use in the parks, as well as areas frequently used for public fishing. Impacts would be minimal, as in-water human activity is limited in Myrtle Edwards Park, particularly during the winter wet season when most stormwater discharges would occur. Recreational shellfishing is prohibited by law on all City of Seattle and most King County beaches, as described in Section 4.4.4, Recreational Fishery. In addition, rip-rap along the shoreline of the Elliott Bay and Myrtle Edwards parks contributes to discouraging non-sanctioned shellfishing activity. Risk to public health due to ingestion of shellfish would be less than under existing conditions.

Conveyance and Regulating Structures

Operational impacts for conveyance and regulating structures are similar to those described for the South Lake Union Subbasin.

CSO Control

While the CSO control facility would be designed with greater storage under this alternative compared to Alternative 1, project design would be similar and would minimize the environmental health risk from overflows.

8.6.3 Alternative - No Action

Untreated CSOs would continue to occur on a regular basis with accompanying public health risks. Because of the cold water temperature in Elliott Bay, water contact recreation is limited, but it does occur. The highest potential health risk would occur following summer CSO events, when water contact recreation such as wading most frequently occurs. Other water-based activities such as kayaking and canoeing occur on a year-round basis. Consumption of shellfish, and to a lesser extent, fish from the vicinity of the Denny Way CSO could present a potential public health risk. Although recreational shellfishing is prohibited on City of Seattle and most King County beaches, occasional shellfish harvest may occur. Risk of ingesting shellfish which has been contaminated by bacteria or viruses discharged through untreated CSOs would be of concern in the vicinity of the outfall. This risk would remain the same as under current conditions, and could increase accompanying future flows.

8.7 NOISE

Under Alternatives 1 and 2, emergency generators may be installed at regulators and pump stations so flows would continue in the event of a power outage. The generators would be installed within a structure with only a minor increase in noise levels. No noise would be generated by Alternative 3 since no facilities would be built.

8.8 LAND AND SHORELINE USE

No proposed Elliott Bay Subbasin facilities under Alternatives 1 or 2 would require a change in land use or designation. The Elliott West site is located in a manufacturing/industrial classification in which a wastewater treatment facility is a compatible land use. Since the area is currently built out, the additional aboveground facilities would not affect the percent of impervious surfaces. Under Alternative 2, any new stormwater outfalls to Elliott Bay would need to be covered under the municipal stormwater NPDES permit (#WASM 23003) issued to the City of Seattle with King County as a co-permittee. Coverage would require implementation of appropriate source control and/or treatment BMPs as part of the project. Operation of the facilities could create odors for adjacent land uses, but these odors would be removed with odor control devices (see Section 8.2). Operation of the facilities would not create significant noise for adjacent properties.

Operation of the outfalls and regulating structures in Myrtle Edwards Park would be within the state shoreline zone. As required by the State Shoreline Management Act of 1971, navigation areas would be kept free of obstructions, outfalls would be located below mean lower low water level, and outfalls would be designed to prevent the entry of fish. An existing anchorage area for the Port of Seattle grain terminal is located off shore from the existing Denny Way CSO (see Figure 4-13). The outfalls would be designed to reduce the potential for anchors to catch the pipe. Also, the location of the outfall closer to shore and in shallow depth, 500 feet from shore and 60 foot depth, would also reduce the potential for obstructing ship anchors. Alternative 3 would require no facilities and would have no operation impacts to land and shoreline uses.

8.9 RECREATION

Operation of the proposed Alternatives 1 and 2 facilities would improve water quality in Elliott Bay, specifically off Myrtle Edwards Park at the existing Denny Way CSO. The reduction in release of CSOs would significantly increase the enjoyment and recreational use in and near the park. Although operation of Alternative 1 and 2 facilities would increase sediment loading at West Point by about one percent, this increase would not significantly impact recreation at Discovery Park. Under Alternative 3, no facilities would be constructed and overflows would continue to discharge on the beach at Myrtle Edwards Park. This would reduce the recreational resource by potential for beach closings after some storms and for the floatables (e.g., plastics, styrofoam, etc.) washing up on the shore.

8.10 AESTHETICS

Except for the proposed facilities on the Elliott West site under Alternatives 1 and 2, the Elliott Bay Subbasin facilities would be constructed entirely belowground. The tunnel, EBI connection, pipelines, regulating structures, and outfalls would be underground. King County has met with businesses and residents near the Elliott West site and acknowledge the concern for potential visual, noise, and odor impacts of the CSO control facility. Mitigation measures would address these impacts (see Chapter 10). Views of Elliott Bay and farther to West Seattle and the Olympic Mountains are currently available and would not be affected by the one and a half story facility. Therefore, no significant aesthetic impacts would occur during operation of these facilities.

The Elliott West site is currently about eight feet below the street grade of Elliott Avenue. The facilities on the site would extend about 50 feet belowgrade; the abovegrade building would be about three and a half stories above street grade. The aboveground facilities would be roofed and architectural treatment and landscaping would be used to reduce the visual impacts from adjacent businesses, Elliott Avenue, and Queen Anne Hill. Architectural treatment would eliminate or minimize sun reflection from the proposed facilities to adjacent properties and Queen Anne Hill.

Since the railroad tracks often have double-decker container train cars parked in front of the Elliott West site and the site is currently below grade, the CSO control facilities would not significantly affect the view of Elliott Bay from residences on Queen Anne Hill or businesses along Elliott Avenue (see Figures 4-10 and 4-11). The current site is a vacant lot with uneven ground and areas where rainwater pools. The enhancement of the site with landscaping should improve the visual quality of the area by providing trees and green areas rather than vacant land. No urban design elements would be impacted by operation of the proposed facilities.

8.10.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

After construction, the site would be landscaped. Figures P-3 and P-4 in Appendix P are representative plans for the landscaping and architectural treatment of the site. Final site, landscape and architecture plans could be different, however, community comments and input would be incorporated into the final plans. A circular driveway would be placed on the northern end of the property with a planting in the middle. The remainder of the site and around the buildings would include grass, plantings, and other landscaping. The entire site would be fenced for security with a gate and retaining wall near the parking area. Security lighting would be visible from unobstructed viewing locations on Queen Anne Hill. Figure 8-1 is a drawing of the Elliott West site with architectural treatment on the buildings and landscaping as viewed from the east side of Elliott Avenue.

8.10.2 Alternative 2 - Partial Separation and Storage

After construction, the Elliott West site would be landscaped. Figures P-6 and P-7 in Appendix P are representative plans for the landscaping and architectural treatment of the site. Final site, landscape and architecture plans could be different, however, community comments and input would be incorporated into the final plans. A driveway would be placed around the north, west, and south sides

FIGURE 8-1

of the property. The remainder of the site and around the buildings would include grass, plantings, and other landscaping. The entire site would be fenced for security with a gate and retaining wall near the parking area. Security lighting would be visible from unobstructive viewing locations on Queen Anne Hill.

8.10.3 Alternative 3 - No Action

Under Alternative 3, no facilities or landscaping would be constructed and the site would remain undeveloped and unlandscaped.

8.11 HISTORICAL AND CULTURAL PRESERVATION

No impacts to historic properties in the project vicinity or potential archaeological deposits would be expected during operation of Alternatives 1 or 2. No cultural resources would be adversely affected by Alternative 3.

8.12 TRANSPORTATION

Under Alternatives 1 and 2, maintenance activities would generate several trips per month on several of the main arterials in the subbasin. Maintenance activities in street rights-of-way may temporarily disrupt traffic. Operation of facilities under Alternatives 1 and 2 would increase biosolids at West Point by approximately one percent, thus increasing biosolids trucks by 25 roundtrips annually, or about 2 additional roundtrips per month. No impacts would occur from Alternative 3 as no facilities would be constructed.

8.13 PUBLIC UTILITIES AND SERVICES

Operation of facilities under Alternatives 1 and 2 would increase flows at West Point by approximately one percent, which is within the variable yearly average.

8.14 SOCIOECONOMICS

Once facilities are completed, all road rights-of-way and public parks would be resurfaced or revegetated. There would be no adverse impacts to any minority or low-income populations or Tribal resources in the project area. Operational impacts would largely be associated with improvements in water quality resulting from the reduction in the frequency and volumes of CSOs in Elliott Bay. CSO discharges vary from event to event, but frequently contain high levels of bacteria, metals, and toxic organic constituents. Although public health officials advise against consumption of fish from Elliott

Bay, some individuals with low incomes rely on such activities to supplement their diet. Individuals catching and consuming fish from Elliott Bay for subsistence would likely experience direct reductions

in the risk of contamination due to the reduced loading of contaminants of concern. With the extension of the existing outfall and construction of a new outfall, nearshore water quality is expected to substantially improve. Although human health risks (as defined by bacterial contamination) would not be eliminated, concentrations of contaminants of concern to human health are projected to decrease. Usual and accustomed fishing grounds of the Muckleshoot, Tulalip, and Suquamish tribes generally would also benefit from improved water quality. In addition, King County would coordinate closely with the Muckleshoot and Suquamish tribes to minimize impacts of CSO treatment and discharge on the existing coho net pen near Pier 86 (refer to Section 8.3, Water Quality).

8.14.1 Alternative 1 - CSO Control and Storage (the Preferred Alternative)

Outfalls, Conveyance and Regulating Structures

Operation of the proposed facilities would not have significant social or economic impacts over the long term. All facility components would be located underground and in existing rights-of-way. No impacts related to population growth would occur. The project is designed to reduce CSO events in Elliott Bay through re-routing of flows to the West Point Treatment Plant. No additional sewer capacity that would serve population beyond what is planned for by the City of Seattle would be provided by the project. No significant impacts to subsistence fish and shellfish harvesting by low income populations are anticipated from operation. Recreational shellfishing is prohibited on most King County beaches (WAC 246-280). Non-sanctioned shellfishing that does occur is limited by lack of accessible beach area along the Elliott Bay shoreline area (refer to Section 4.4.4, Recreational Fishery). Although use statistics are not available, most fishing activity likely occurs on a public fishing pier just north of the grain terminal, but on occasion some fishing activity occurs from the rocks at Myrtle Edwards Park. Fishing activity on the pier is not anticipated to be affected by operation.

CSO Control

There are often concerns about the impacts of wastewater facilities on the value of adjacent properties due to the potential for odors or visual impacts. The severity of such impacts can vary widely based on the location, design, and operation of the individual facility as well as the character of surrounding properties. Impacts to commercial properties are less likely compared to residential properties. Facilities equipped with odor controls and designed to minimize visual impacts are much less likely to have any impact on property values (Sidwell 1996). Operation of the Elliott West CSO Control Facility would not be expected to result in any significant impacts to adjacent commercial or residential property owners. After construction, area roadways would be restored. A landscape plan has been developed to screen the facility from view of adjacent properties with a berm and vegetation (see Figure 8-1). Controls have also been designed for the facility to minimize odors should they become a problem. The County has purchased the proposed Elliott West CSO Control Facility site for approximately \$4.75 million (plus additional closing costs). While use of the site for the control facility would preclude its use for future commercial business purposes, the site is currently vacant, and the dedication of the site to use for the control facility would not result in any direct loss of business.

8.14.2 Alternative 2 - Partial Separation and Storage

Operational impacts would be similar to Alternative 1.

8.14.3 Alternative - No Action

No facilities would be constructed under this alternative. As a result, there would be no social or economic impacts from operation of any facility.